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EVALUATION OF BLACK STAIN ROOT DISEASE CONTROL BLOCKS AND A PINE NEEDLE-SHEATH MINER INFESTATION ON MCCLOUD RANGER DISTRICT, SHASTA-TRINITY NATIONAL FORESTS

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ABSTRACT

Mortality of ponderosa pine continues to occur in the McCloud Flats area. Most of this mortality is caused by either black stain root disease or annosus root disease, in association with western pine beetle, mountain pine beetle, and California flatheaded borer. The mortality is scattered as groups of dead trees in the stands surrounding clearcut blocks in the Edson Creek - Widow Springs area. Both of these root diseases have been active in these stands for many years and will continue to cause scattered mortality as the stands are converted to mixed conifer type. Ponderosa pines naturally seeding into the Edson Creek clearcut will probably not affect the black stain control program, but ponderosa pine should not be planted at this time. A biological evaluation should be requested during the timber sale planning process for sales adjacent to the clearcuts to determine if borax treatment is needed to prevent infection by annosus root disease.

The pine needle-sheath miner caused less than 10 percent defoliation to most trees in the Lava Burn plantation during 1981. Approximately the same level of defoliation can be expected in 1982. Very little growth reduction should result from the defoliation.

CURRENT SITUATION AROUND BLACK STAIN ROOT DISEASE CONTROL BLOCKS

On April 28, 1982 we went with Bob Austin, silviculturist, McCloud Ranger District, to the black stain infestations at Edson Creek and Widow Springs. We scouted the areas in and around the clearcut blocks attempting to locate root disease centers.

In the Widow Springs area, a group of several dead ponderosa pine was present along the edge of the clearcut margin. Black stain root disease (Ceratocystis wageneri) was identified as a principal cause of mortality, in association with the western pine beetle (Dendroctonus brevicomis). An old fruiting body of Fomes annosus, cause of annosus root disease, was found in one pine stump in the clearcut area, but mortality was not associated with it.

In the stands surrounding the Edson Creek clearcut, several black stain and annosus root disease centers were found. Most of our time was spent on the east side of the road where disease centers of both fungi were identified and recent ponderosa pine mortality was present. Several black stain root disease centers were of considerable size and were coalescing in this area. In addition, annosus root disease was located both separate from, and in association with, black stain disease centers. Annosus root disease was involved in mortality of various size-classes of ponderosa pine in some centers. Black stain root disease was involved in a larger proportion of the mortality, involving a larger land area, than annosus root disease. In general, the individual black stain disease centers were larger, with up to 20 to 25 trees each, while many of tha annosus disease centers involved only a single old stump and mortality of up to four to five trees each. Western pine beetle, mountain pine beetle (D. ponderosae), or the California flatheaded borer (Melanophila californica) were usually involved in the mortality.

A brief time was spent on the west side of the road on April 30 to determine the need for a more intensive survey of the area prior to a proposed shelterwood cut. Both black stain and annosus root diseases were killing ponderosa pines along the clearcut margins. The size and number of root disease centers did not appear as large as on the east side, but both fungi have the potential to impact future stand management. It is suggested that District personnel contact the Forest Pest Management Staff for a biological evaluation of this area during the timber sale planning process. This evaluation will aid in determining if borax treatment of stumps during the sale is justified and if these two diseases may affect silvicultural prescriptions.

Ponderosa pine is beginning to naturally regenerate in parts of the clearcut at Edson Creek and its presence is of concern to field personnel because of the possibility of prolonging the longevity of the black stain fungus on the site. As of this time, none of these seedlings has died from infection, probably because their small root systems have a low probability of contacting old infected root masses. The likelihood of survival of ponderosa pines on this site increases with the time from clearcutting and some of these naturally regenerated pines may reach commercial size. Leaving these pines should not adversely affect the black stain control program; however, it is difficult to justify the expenditure of resources to artifically regenerate these sites with ponderosa pine until more information is known about the fungus and its longevity in the soil.

PINE NEEDLE-SHEATH MINER IN THE LAVE BURN PLANTATION

Bob Austin noticed some defoliation in the Lava Burn Plantation and requested an evaluation of the area. We examined the plantation with Bob on April 29, 1982.

OBSERVATIONS

The Lava Burn Plantation is about 10 miles south of Medicine Lake. It is comprised entirely of ponderosa pine and covers about 1,000 acres. The area was planted in blocks which range in age from several to more than 10-years-old. The site quality changes rapidly in the area from fairly good to marginal as the depth of the soil overlying lava flows changes. The tree crowns in the blocks of older trees are approaching the point of closure and most areas have some degree of brush competition.

Defoliation of the 1981 foliage was visible on the leaders and upper branch tips of trees in the older blocks due to the feeding of the pine needle-sheath miner (Zelleria haimbachi). The amount of defoliation on most trees was less than 10 percent, but because it was concentrated on a few branch tips per tree, it was rather conspicuous. A few of the older trees located near the roads were defoliated up to 50 percent. The blocks of younger trees had almost no visible defoliation.

The foliage of some of the older trees that showed visible feeding injury and of a few trees that were recently felled for a fuelbreak were examined to determine the relative abundance of pine needle-sheath miner larvae. Most of the trees had very few or no larvae, and less than 10 larvae were detected on the most heavily infested tree examined.

DISCUSSION

Most foresters are concerned about tree defoliation only as it relates to reduced growth, reduced vigor, or death of the trees. Although locally dense populations of the pine needle-sheath miner have caused nearly total defoliation of hard pines from time to time in the west, no tree mortality as a result of the defoliation has been observed. Information on the effects on growth caused by defoliation by the pine needle-sheath miner are limited to a few observations. Ponderosa pines which are less than about 10-years-old show no apparent growth loss after severe defoliation by this insect. The reason for this is unknown, but it has been hypothesized that the relatively high radial growth rate of young trees masks any effect of the defoliation. Nearly total defoliation of older ponderosa pine produced a radial growth reduction in the year following the defoliation. After one year of severe defoliation the average radial increment was reduced by 25 percent and in the year following a second successive defoliation, the average radial increment was reduced by 46 percent. The level of growth reduction that the current defoliation in the Lava Burn plantation would produce is probably low enough that it would be indistinguishable from the normal fluctuations in growth due to climatic changes.

The actual number of pine needle-sheath miner larvae per tree in the Lava Burn plantation is probably higher than we observed. The larvae were mining in the needle bases at that time and were difficult to detect. If there were actually 10 times the number of larvae present than we counted, then there would be up to 100 larvae on some trees with fewer larvae present on most. Each larva destroys 6-10 needle fascicles during its life cycle, so this level of infestation would cause the loss of only 1,000 or less fascicles per tree. This would be unsightly if it all occurred on a few branches, but probably would not cause severe damage to the tree. Based on the number of larvae present in the plantation, the level of defoliation in 1982 should be roughly the same as that seen in 1981.

Adverse site conditions and competition do not seem to be connected with outbreaks of the pine needle-sheath miner, although feeding damage is commonly seen on slowly growing trees. The same level of feeding is more likely to be visible on trees with smaller or sparser crowns than on vigorous trees. A given level of defoliation is also likely to result in a greater reduction of growth in a tree already growing slowly than in a rapidly growing one. If the Lava Burn plantation were thinned and the brush was reduced, it would not end the current infestation, but it would compensate for any growth reduction due to the defoliation and would provide some lasting positive benefits.

BIOLOGY OF THE PINE NEEDLE-SHEATH MINER

The pine needle-sheath miner (Zelleria haimbachi) is widely distributed in the pine forests of the United States and Canada. The larvae feed on the foliage of young 2- and 3-needled pines, principally ponderosa, Jeffrey and lodgepole pines in the west. Populations are usually light, although some areas are more prone to repeated infestations, with densities remaining high for 2 or more consecutive years.

The adult moth lays eggs on the current year's foliage about mid-June to mid-August. The larvae hatch from the egg and bore directly into the needle. The first instar larvae overwinter in the needle, feeding when temperatures are favorable. About the time that the new pine shoots begin to lengthen in the spring, the larvae moult to the second instar and abandon the mine in the needle. The larvae spend the next 3 instars feeding within the sheaths of the young needles on the new growth. Toward the end of the larval stage, the larvae are so large that only the head and first few body segments can be inserted into the needle-sheath through a hole cut by the larvae. Pupation takes place in silk webbing around the needle bases. Numerous species of parasites attack the larvae and pupae and have a role in regulating the populations.

The first sign of an infestation is usually a fading of some of the developing needles of the new growth. Needles are attacked throughout their period of elongation. The developing needles stop growing and begin to fade while the longer ones are cut off within the needle sheath and droop. Eventually the dead needles are blown away by the wind. If the population is light, the needle loss may be hardly noticeable.

MANAGEMENT OPTIONS

1. Do nothing. Some trees in the older blocks of the plantation will show a 5-10 percent defoliation in 1982 and a few will be more severely defoliated. Growth reductions will probably be minimal. It is unknown at what density the pine needle-sheath miner population will be in 1983. Tree crowns in the older blocks will begin to interlock within a few years and growth will decline.

2. Control pine needle-sheath miner. Malathion (Thompson-Hayward Chemical Co., EPA No. 148-590) is registered for control of pine needle-sheath miner. The application would be effective for one season. An environmental assessment, economic analysis, and pesticide-use proposal would be necessary prior to the treatment.

3. Thin plantations and control brush. Cutting down infested trees would kill some pine needle-sheath miner larvae, but would result in little change in the course of the infestation. The resulting increase in vigor would help offset any growth reduction due to defoliation. Thinning from mid-July through late-November, combined with lopping and scattering the slash in sunny areas, would reduce the risk of pine engravers (Ips spp.) building up in the slash and causing losses of the leave trees. In addition, controlling the brush would reduce the competition for moisture and nutrients and increase the vigor of the residual trees.